

NITROGEN DIOXIDE (NO₂)

NATURE AND SOURCES

Nitrogen dioxide (NO₂) is a member of the nitrogen oxide (NO_x) family of gases. It is formed in the air through the oxidation of nitric oxide (NO) emitted when fuel is burned at a high temperature. The monitoring network measures concentrations of NO₂ in the air to compare with national air quality standards, and EPA tracks national emissions of NO_x. The major sources of NO_x emissions are automobiles, power plants, and any other industrial, commercial, or residential source that burns fuel.

HEALTH AND ENVIRONMENTAL EFFECTS

Exposure to NO₂ has been associated with an increased risk of respiratory illness in children. Short-term exposures (e.g., less than three hours) to low levels of NO₂ may decrease lung function in individuals with pre-existing respiratory illnesses. Long-term exposures well above ambient NO₂ levels may cause irreversible changes in lung structure.

NO_x contributes to other air quality problems that cause a variety of health and environmental impacts. For example, ground-level ozone forms when NO_x and VOCs react in the presence of sunlight. NO_x reacts with ammonia and moisture to form nitric acid and particle nitrates. NO_x reacts with organic chemicals or ozone to form a variety of toxic products including nitrate radicals, nitroarenes, and nitrosamines. NO_x also contributes to nutrient overloading that deteriorates water quality and plays a major role in visibility impairment and acid rain.

TRENDS IN NO₂ CONCENTRATIONS

Nationally, concentrations of NO₂ decreased 30 percent between 1990 and 2006, as shown in Figure 23. In 2006, NO₂ concentrations were generally the lowest of the 17-year period. All recorded concentrations were well below the level of the national standard (0.053 ppm).

TRENDS IN NO_x EMISSIONS

Between 1990 and 2006, NO_x emissions decreased 29 percent, as shown in Figure 24. Most NO_x emissions come from transportation and fuel combustion sources, which decreased by 21 and 41 percent, respectively. Overall, NO_x emissions did not change much between 1990 and 1998. After 1998, NO_x emissions showed a decrease similar to the decrease in NO₂ concentrations shown in Figure 23. NO_x emissions from transportation sources decreased 17 percent, and fuel combustion sources decreased 38 percent between 1998 and 2006. Most of the fuel combustion NO_x emission reductions were due to the Acid Rain Program, which began in 1995, and implementation of the NO_x SIP Call, which led to sustained reductions beginning in 2003 and 2004.

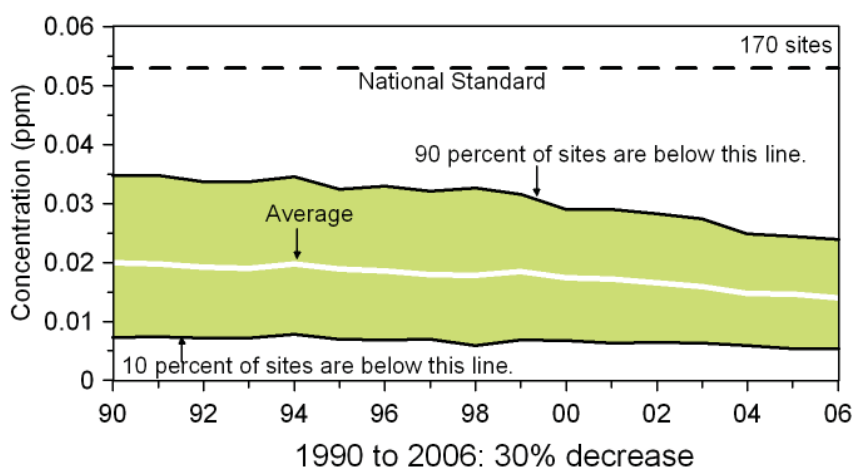


Figure 23. National NO₂ air quality trend, 1990-2006 (annual average).

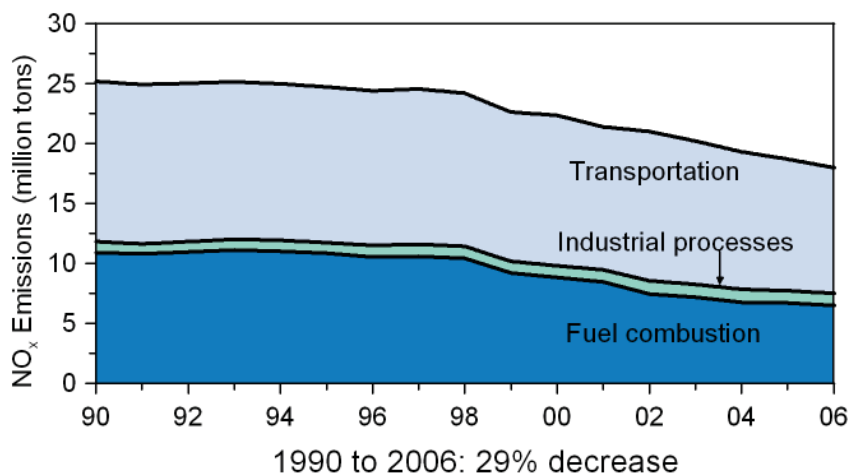


Figure 24. National trends in annual NO_x emissions, 1990-2006.